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ABSTRACT

One of the major concerns of educators today is the determination of the factors that play a role in the career choices of women. This document summarizes a Saskatchewan thesis study that explored female grade 12 high school students' perceptions of the factors that influenced their traditional or nontraditional science career aspirations. Of particular interest was the influence of the gender of the teacher. Parents, older siblings, other people, work experiences, volunteer experiences, and certain school experiences strongly influenced female career choices. However, this study revealed that female high students commonly exhibited doubts about their academic ability and expressed fears that they would not succeed. Several factors influenced nontraditional student career aspirations more than those of traditional students. For example, nontraditional students received more verbal and active support from their parents. They had more shared experiences with their fathers. Nontraditional students generally had long-range career plans with options as an integral part of the plan. Even though they had doubts about their ability, they did not allow these to affect their nontraditional career aspirations. The gender of the science teacher appeared to have little overt impact on the career decisions made by female students. (Author/CW)

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RESEARCH IN BRIEF

Female Student Career Aspirations In Science

SSTA RESEARCH CENTRE REPORT: #94-04 DATE: May 1994

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This report is a summary of a thesis entitled **Factors Influencing Traditional Or Non-Traditional Career-Related Aspirations Among Female High School Students Enrolled In Science Courses** by Sharon Bender. The report explores female grade 12 high school students' perceptions of the factors that influenced their traditional or non-traditional science career aspirations. Of particular interest was the influence of the gender of the teacher.

Parents, older siblings, other people, work experiences, volunteer experiences, and certain school experiences strongly influenced female students' career choices. However, this study revealed that female high school students commonly exhibited doubts about their academic ability and expressed fears that they would not succeed.

Several factors influenced nontraditional students career aspirations more than those of traditional students. For example, non-traditional students received more verbal and active support from their parents. They had more shared experiences with their fathers. Non-traditional students generally had long-range career plans with options as an integral part of the plan. Even though they had doubts about their ability, they did not allow these to affect their non-traditional career aspirations.

The gender of the science teacher appeared to have little overt impact on the career decisions made by female students.

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SUMMARY REPORT: Factors influencing traditional or non-traditional career-related aspirations among female high school students enrolled in science courses

Rationale

Many factors influence the career choices of female students. Persons such as parents, siblings, peers, teachers, guidance counsellors and role models may affect students' career aspirations. Experiences at home, experiences in school, including those in science classes, and experiences in the work force may shape the way females plan for the future.

The underrepresentation of women in traditionally male science careers is a concern raised by many researchers (Kahle, 1983b; Kelly, Smail, & Whyte, 1984; Science Council of Canada, 1981). In Canada and the United States very few women, usually less than ten percent, are scientists, engineers or technologists (Kahle, 1983a; Statistics Canada, 1985). Even in medicine and health-related careers, where women comprised 77.1 percent of those employed in these fields, most of the women in this area were nurses. Ninety-seven percent of all nurses were women as contrasted with 35 percent female physicians and 20 percent female dentists (Statistics Canada, 1985).

These statistics are alarming. With more women participating in the work force, why do they continue to work in a limited number of fields, such as nursing, secretarial, and clerical occupations? This question leads to another: what factors influence female students' decisions to follow traditional career paths? Perhaps more importantly, why do relatively few female students choose non-traditional science careers? These questions have not been studied in depth.

The literature indicated that a wide variety of factors affected female students' career choices. Because a large number of variables are implicated as possible influences and because it would be impossible to control or manipulate these variables, the study employed qualitative methods to identify factors that influenced female students' career aspirations.

The purpose of this study was to identify factors that influence female students' career aspirations. The research questions explore differences between traditional and non-traditional science career aspirations of high school students. The impact of female and male science teachers on students' career choices was also studied.

Literature Review

The literature was reviewed to determine which factors influenced the types of career choices made by females. The types of careers chosen seemed to be influenced by a wide range of factors.

The strongest influence seemed to be the parents (Lunneborg, 1982; Young, 1985). If parents' expectations of their daughters were limited they often allowed their daughters to drop out of classes, such as mathematics and sciences, thus limiting their choices of non-traditional science careers (Basow & Howe, 1980; King, 1989; Lemkau, 1979; OECD, 1986; Young, 1985). The types of activities in which female children were engaged in with their fathers may have been an important factor (Lunneborg, 1982; Nelson & Keith, 1986). The type of support the females received

from their parents was important (Auster & Auster, 1981; Basow & Howe, 1979, 1980; King, 1989; Young, 1985).

Siblings may also impact on career choices, although the literature provides little research in this area. The position in the family and the presence of brothers in the family may influence the career choices of females, especially non-traditional career choices (Auster & Auster, 1981; Lemkau, 1979).

Studies indicated that peers were not very influential in the direct career decision making process of females (Armstrong, 1980; Basow & Howe, 1980). However, in an indirect way peers may have limited the options open to female students if appropriate classes were not taken as a result of peer pressure (Cohen & Cohen, 1980; Smail, 1985).

The school may have had an important influence. If female students were treated differently in the science classroom than male students with male students being allowed to dominate the classroom, the female students might not have developed the skills or the confidence to consider a non-traditional science career (Good, Sikes & Brophy, 1973; Haggerty, 1987; Jones & Wheatley, 1989; Kahle, 1983a, 1983b; Kelly, 1976, 1978; Parker & Offer, 1987).

The influence of teacher gender was unclear due to conflicting reports in the literature. Some of the studies indicated female teachers were a strong influence on female students while others stated the teachers' gender was not an influence (Harlen, 1985; MacIver, 1987; Shinedling & Pedersen, 1970; Stake & Granger, 1978). Female and male science teachers taught differently, however, the impact of different styles is

unknown (Good et al., 1973; Harlen, 1985; Lawrenz & Welch, 1983). Whether or not students were aware of the differential treatment was questionable.

There was some evidence that female students related better to female teachers (MacIver, 1987; Stake & Granger, 1978). However, the data were far from conclusive. Because there were so few female science teachers it was difficult to determine if the gender of the teacher influenced the female students' career choices.

The guidance counsellor did not seem to be a major influence on female students' career aspirations. Auster and Auster (1981) reported that counsellors had little effect on or had negative reactions to the non-traditional career choices of female students. However, there were some studies that indicated special intervention programs implemented by guidance counsellors expanded the career options considered by female students thus suggesting that guidance counsellors can affect female students' career decisions (Harris, 1974).

The presence of role models, particularly professional role models, might have encouraged female students to consider non-traditional science careers (Elliott, 1972; Getz, 1982; Kren, 1979; O'Donnell & Andersen, 1978). The length of exposure to a role model seemed important in determining his/her effectiveness.

Past experiences influence career choices. Female students with wider ranging non-traditional experiences tended to consider non-traditional careers more often than those who had limited experiences (Kingdom & Sedlacek, 1981; McLure & Piel, 1987; O'Donnell & Andersen, 1978).

In conclusion, the factors influencing the career aspirations of female students were many and varied. Determining which are the most influential is a difficult task because several of the factors are covert, thus, the students may not be aware of them. By looking at the factors in general and then focusing in on a few of the factors this study may help to fit a few more pieces into the puzzle.

Methodology

Classes were selected from several rural, small urban and large urban schools in Saskatchewan. The presence of at least one female science teacher teaching grade 12 biology, chemistry, or physics determined the selection of a particular rural or urban school. The sample consisted of grade 12 students from eight classes taught by female science teachers and from eight classes taught by male science teachers.

All students in each class completed a survey which was a modification of Basow's (Basow & Howe, 1979) Influence of Role Model Scale . This scale was selected because it required students to rate the influence various people had on their career decisions.

They also completed a general information questionnaire which was used to gather background information. In addition it asked students which science and mathematics classes they took and their grades in each. The top three career choices were requested from each student.

The final sample consisted of 409 students, 210 female and 199 male. Interview appointments were made with 44 female students. Thirty-eight students

came for the interviews as scheduled, 21 from the traditional career sub-group and 17 from the non-traditional science career sub-group. Of the 21 students in the traditional career sub-group, 11 had female science teachers and 10 had male science teachers. Of the 17 students in the non-traditional sub-group, 10 had female science teachers and seven had male science teachers.

Students were selected for interview after completing the Influence of Role Model Scale and after an analysis of the general information instrument. The female students selected had chosen either traditional female careers or non-traditional female science careers. They had similar science and mathematics academic records with average grades of 70 percent or higher.

An open-ended interview was selected because it provided for greater flexibility and deeper probing leading to a better understanding of the factors that influenced the career aspirations of students (Bernard, 1988; Spradley, 1979; Stewart & Cash, 1985). Because current literature may not have identified all factors which influence career choices, an open-ended question style was used in an attempt to uncover previously unidentified factors and influences. The interview style used allowed for probing the interviewees for more in-depth answers or more information (Spradley, 1979).

The interviewee completed a time line questionnaire indicating careers she had contemplated since age six. Each career was discussed. The interviewer asked the student why she chose the career, what her family, friends, and teachers thought of the career choice, how she responded to various persons' comments, and why she changed

her career choices. The actual questions asked by the interviewer often depended on the statements made by the student being interviewed.

The interviewer also asked whether she had considered related but alternative careers and why or why not. The alternative career suggested was usually a more non-traditional career.

After the time line was discussed, the student was asked about her chosen career. She was questioned about the education involved, where she could obtain the education, and the length of the education. This line of questioning was employed to determine how much knowledge the student had about the occupational preparation necessary to attain her goal.

The student was also asked about her elementary and high school science classes. She was asked which senior science class she liked best, which she liked least and why. This questioning was used to determine the science teacher's influence and to determine the student's awareness of differential treatment.

The student was asked to identify anyone or anything else that had influenced her career choices. She was asked how these factors influenced her and how she reacted to the influence. This question was asked to be sure none of the major influencing factors were omitted.

The interviewer asked one more question: "If you could be anything you wanted without concern for finances, ability, or anything else, what would you be?" This question is referred to as the "wish career". The question was asked to determine

if the career chosen by the student was what she really wanted to do and to provoke discussion.

Data Analysis

Influence of Role Model Scale data were compared using t-tests for each of the items on the scale. The female students who had selected traditional female careers were compared with female students who had selected non-traditional female science careers. They were compared on the basis of whom they perceived as having encouraged or discouraged their career aspirations.

A chi-square analysis was used to determine whether the career options were significantly related to the gender of the teacher.

Taped interviews were transcribed. Students were separated into traditional or non-traditional sub-groups. Responses within each sub-group were categorized according to specific influences cited by students. Categories that emerged which showed a level of influence were: parents, teachers, guidance counsellors, siblings, peers, other adults, school experiences, science classroom experiences, other experiences, post-secondary education, career plans, careers suggested by the interviewer, and wish careers.

A second analysis was performed on the summary data relating to science classes and to science teachers. The sub-groups were further sub-divided according to whether students were taught by a female or a male science teacher. Data were then reanalyzed according to these sub-divisions. The purpose of this reanalysis was to determine if the gender of the science teacher influenced the students' career

aspirations. Similar and different responses were noted within and between the sub-divisions.

Significant Findings and Conclusions

Several factors stood out as influencing female students' career choices. The dominant factors included parents, older siblings, and experiences.

Parents were identified by students as the strongest influence on their career choices. The students in this study relied heavily on their parents' support and encouragement. Students often changed their career plans, usually to more traditional careers, if they did not receive strong support from their parents.

Older siblings also strongly influenced students' career aspirations. All but one student who had older siblings discussed ways that older brothers and sisters influenced the students' career choices. The literature did not specify older siblings as an influence except to describe successful women in non-traditional careers as being only children, the eldest child or having no or fewer than the average number of brothers (Auster & Auster, 1981; Lemkau, 1979). Students considered older siblings to be smarter and harder working. If brothers and sisters did not succeed in university programs or in careers, the students assumed they had little chance of success. Because of these perceptions, female students tended to be susceptible to comments made by older siblings. If students received discouraging comments from older siblings, they often changed their career aspirations to more traditional careers.

All students expressed strong doubts about their abilities. Doubts and feelings of inadequacy possibly resulted from young girls not being encouraged to be independent and self-confident (Jones & Wheatley, 1988; Maccoby & Jacklin, 1974; OECD, 1986).

Students identified few specific aspects of school which influenced their career choices. Career days was the one school experience that influenced several students. Students described career days as having affirmed their career choices, having created an interest in careers they had not considered, or having made them reconsider their career choices. Several students expressed a concern for the lack of information available to students about careers. This may explain the strong influence career days had on students. Career days may have been the only time the students received information about the careers they were interested in pursuing.

In early elementary grades, teachers were seen as an influencing factor. Many of the students considered being teachers when they were young because of their teachers. However, as students got older, they saw teachers as having little effect on their career decisions. Teachers may have had a covert influence on students' career aspirations. For instance, if a teacher made biology interesting, a student may have considered a career in the biological sciences without being aware of the teacher's influence.

Guidance counsellors were generally viewed as people who provided information about post-secondary institutions and little else. However, a few students indicated their guidance counsellors influenced them by convincing them to consider

specific careers. Other students talked about negative experiences with guidance counsellors which in some cases caused the students to reconsider their career choices. These experiences suggest that guidance counsellors can influence the students' career choices.

Many of the students talked about entering careers that relatives and friends of the family were in. Through their actions and through their encouraging or discouraging comments, these people influenced the students' career choices. If encouraged, it strengthened the students resolve. If discouraged, it caused many of the students to reconsider their career choices.

Students' experiences on the job and in volunteer activities strongly impacted their career aspirations. If they had positive experiences, the students often considered a career related to the experience. Negative experiences encouraged the students to consider different careers.

The students who discussed raising families did not see themselves combining a family and a career. All of them stated they would prefer not to work while their children were young. Because of this, several students chose careers which they considered to be less demanding and easier to leave for a few years.

In addition to the common influencing factors mentioned above, several factors influenced the traditional and non-traditional students in different way. In some cases similar factors influenced the two groups but in divergent ways. The students also responded differently to similar influencing factors.

Both the Influence of Role Model Scale results and the interview analysis indicated that mothers were identified more often by daughters with traditional career aspirations as having encouraged their career choices. Therefore, if parental support was important, as was stated earlier, and mothers encouraged traditional career aspirations, female students would likely be more confident choosing traditional careers.

The non-traditional students who were interviewed discussed experiences they shared with their fathers more than traditional students. They also described more non-traditional experiences as a result of this contact. These experiences allowed the students to have a wider frame of reference from which to choose careers.

Non-traditional students more often discussed verbal and active support from their parents. The active support provided more experiences for the students. These experiences provided the students with more options.

The parents of non-traditional students gave their children more encouragement to attend university. However, the students were usually expected to attend the university closest to home even if it meant changing their career plans. This was the case for both groups. The traditional students often bowed to this pressure and chose another career.

The non-traditional students interviewed talked about people they knew in their field of interest. The non-traditional students had a wider range of potential role models. They also talked more to these people about their careers rather than just

observing them. By discussing careers, they received a better picture of what the education and occupation entailed.

The non-traditional students sought out information about the careers they planned to pursue. They often researched their career choices, reading pamphlets and talking to people. The non-traditional students were more likely to talk to teachers and guidance counsellors about their career aspirations. Students who were more prepared were less likely to be caught by surprise when problems arose while they planned for their future career. Several non-traditional students in this study stated that students needed more information on careers. More information allowed them to be better prepared for the future.

The non-traditional students more often than traditional students had long-range plans for the future. These plans had options built into them in case they were not accepted into their chosen programs or if they did not succeed in the programs. Their long-range plans appeared to make them more confident, possibly because they had options which they could take if their original career choice did not work out.

The non-traditional students tended to have more positive attitudes towards science and science teachers. This was supported by the higher percentage of non-traditional students who rated science teachers as having a strong influence on them. This positive attitude may account for their science career aspirations. It was not clear what factors caused the positive attitudes.

Non-traditional students were affected less by people's negative comments about the students' career choices or negative comments about students' abilities. The

non-traditional students often took an attitude of "I'll show them." They were more willing to take a chance even if they might not succeed. This was possibly due, in part, to the career plans they had with alternate paths available to them, as well as greater parental support. The traditional students interviewed were more likely to choose another career.

It was unclear from the data collected what influence, if any, the gender of the science teacher had on female students' career aspirations. The students did talk about female science teachers as often as male science teachers. Considering that from 75 to 100 percent of the students' high school mathematics and science teachers were male, it seemed likely that male science teachers would have been mentioned more than female science teachers. Also, the students interviewed indicated they preferred the type of teaching strategies that female teachers tend to use.

Recommendations to Boards of Education

The findings of this study have several implications. First, being aware that some female students may lack confidence in their abilities, especially in science and mathematics, teachers must make a special effort to encourage and to build the confidence of female students. Female students' confidence in themselves can be built by providing students with a wide variety of interesting science experiences at which they can achieve success.

Student confidence could also be built by providing students with examples of women successful in science careers, the viability of such careers becomes more

realistic for them. This is especially true if they can talk to women who successfully combine their careers and family lives.

Providing students with information on science careers would increase their knowledge of the careers available and the requirements for education in various fields. This information may provide female students with options they had not considered. Also, if the students are aware that there are several routes available to them, it may help them overcome their fear of failure sufficiently that they try a career they otherwise would not risk. Continued support of career days would help provide some of the information students need to make informed decisions. Extra effort is needed to find easily accessed information about careers.

Guidance counsellors and teachers need to help students make flexible, long-range career plans. The more prepared the students are the more likely they are to try non-traditional science careers. The preparations may help reduce the fear of failure.

Finally, parents need to be educated about career opportunities in science. They need information on the importance of actively supporting their daughters' career aspirations. The more support the students receive from their parents the more likely the female students are to consider all of their options, including non-traditional science careers.

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